REMARKS

This paper is responsive to the non-final Office Action of January 25, 2008. Reconsideration and allowance of claims 10, 12, and 14-23 are requested.

The Office Action

Claims 10, 12, and 14-23 stand rejected under 35 U.S.C. § 102(3) as being anticipated by Suri (US 6,718,055).

The Present Application

The present application is directed to a method of visualizing perfusion of an organ. For example, a patient is injected with a contrast agent and a series of magnetic resonance images are generated. The contrast agent is selected as one which both perfuses through a membrane or other tissue of interest and is readily identifiable in a magnetic resonance image. By watching the distribution of the contrast image over time in a series of magnetic resonance images, the rate at which the contrast agent perfuses through the membrane of each cell or other tissue of interest can be determined. This diffusion rate is indicative of various medical conditions. For example, dead or badly diseased cells may have no uptake of the contrast agent while, normal, healthy cells will have an uptake of the contrast agent at a rate which is generally associated with such healthy cells.

Because perfusion images are taken over a relative long time, there is typically patient movement, such as respiratory movement under which the chest cavity expands and contracts. In an image through the torso of a patient lying in his/her back, the spine remains still while the organs near the lungs are displaced. Thus, portions of the image move and portions do not. The inventors propose to define a reference region in the immediate vicinity of the organ of interest and track the rotational and translational movement of that region of interest. Specifically, the present application proposes to determine a transform for each image of the series which transform transforms the position of the reference region to the same postion as the reference region in a preceding image. In one embodiment, the preceding image is the immediate preceding image. In another embodiment, the reference image is the first image of the series.

Once this transform of the reference region is determined, it is applied to the entire image. It should be noted that this transform will cause portions of the image which had been stationary, such as the spine, to move from image to image with respiratory motion. Similarly, other areas outside of the reference region may also move from image to image. But, the reference region of the organ is held stationary.

By keeping the reference region stationary, the movement or perfusion of the contrast agent in the organ can be readily tracked from image to image simplifying perfusion measurements.

The Claims Distinguish Patentably Over the References of Record

Claim 10 calls for determining a transform between a reference region in each image and the same reference region in an immediately preceding image of the series of images. Suri develops his transform in a different way. Specifically, as seen in Figure 3, Suri compares each image or test volume with the reference data volume 40, typically the initial data volume (col. 6, lines 28 and 29). Suri goes through a transform optimization 44 which is iteratively repeated to minimize the entropy (col. 6, lines 42-43). The entropy minimization or convergence process 54 is explained in detail at col. 6, lines 42 - col. 8, line 12. It should be noted that the improved transform T is relative to the initial transform 46 and the initial or reference volume 40.

Thus, unlike claim 10 which calls for the transform to be determined based on the same reference region in a current image and an immediately preceding image, Suri develops the transform based on the difference between the current image and the initial or reference image. Accordingly, claim 10 is not anticipated by Suri.

Claim 12 calls for determining a reference image in each image of the series. By contrast, Suri downsamples (col. 6, line 49) and smoothes and applies image wide registration process (col. 8, lines 13-39).

Claim 12 further calls for the transform to be determined based on the current image and an preceding reference image, which reference image is an immediately preceding image. Again, Suri develops a transform relative to the initial reference image.

Claim 16 calls for the transform to be limited to translation and rotation. Suri discloses a more sophisticated image registration which is not limited to translation and rotation.

Accordingly, it is submitted that claim 12 and claims 14-20 dependent therefrom distinguish patentably and unobviously over the references of record.

Claim 21 calls for performing the transform generation on every pair of successive images in a series. Suri determines a transform relative to a reference image. Further, claim 21 calls for the transform to be determined from a reference region in the immediate vicinity of the organ. By contrast, Suri registers downsampled images. Accordingly, it is submitted that claim 21 and claims 22 and 23 dependent therefrom are not anticipated by Suri.

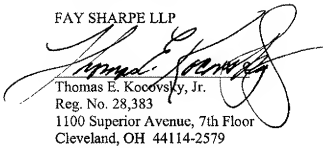
CONCLUSION

For the reasons set forth above, it is submitted that claims 10, 12, and 14-23 are not anticipated by Suri. An early allowance of all claims is requested.

In the event the Examiner considers personal contact advantageous to the disposition of this case, he is requested to telephone Thomas Kocovsky at (216) 861-5582.

Respectfully submitted,

FAY SHARPE LLP



Thomas E. Kocovsky, Jr.
Reg. No. 28,383
1100 Superior Avenue, 7th Floor
Cleveland, OH 44114-2579
(216) 861-5582